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1 Ship Lining Material. Trial of the Schoop process for metal spraying of coatings of lead, aluminum, and copper on various materials, especially concrete, have recently been made at the Bureau, but none of this type of coating so far obtained seem suitable for the lining of concrete ships. Arrangements are being made to continue the work with an air blast more perfectly dried and also with blasts of nitrogen or carbon dioxide. The most promising method now under consideration for the lining of concrete ships (oil tankers) appears to be that of using lead sheet with autogenously welded joints, which appears to be in every way practicable.

2 Heat Treatment. Case hardening and treatment of a special silicon chromium machine gun barrel was carried out without warping or changing dimensions and the barrel has since been successfully fired. Several special nickel chromium alloys and high speed steels have been studied and the relation of the rates of cooling to hardness and micro-structure were determined.

3 Metallographic Testing. Metallographic tests recently conducted included the following subjects: 3 gun steel blooms and 2 of Ni-Cr steel showing flakes; a gas check ring; a broken steering arm from a motor truck; 2 semi-steel shells; 1 shell showing "ghosts"; 1 shell with unusual fracture; 2 gas shells; exploded gun; failed detonating pins; 4 broken parts of Browning machine gun; rifle receiver castings; 1 broken gun lever latch; 1 special ingot; 6 broken tension bars; 15 shell slugs; aircraft materials including 15 steel samples showing flakes in steel and hair cracks in crank shafts, samples of sheet steel and aluminum, broken Liberty motor crank shaft; 2 Johansson gages; 8 samples of high speed steel; tempered copper; hair cutters; machete blades; coatings of rifle barrels (for War College); tests of horse shoe nails for Engineering Depot; and a very important test of cast-to-shape high speed steel cutters for the War College which indicates possibilities of great economies in the manufacture of such tools.

4 Miscellaneous Metallurgical Information. Information recently handled by correspondence includes the following subjects: collapsible tin tubes; lead splash

bullets; effect of copper in gun steel; liquid forging process for aluminum alloys; lead coated steel; temperature control of steel-making furnaces; use of iron crucibles; standard spelter specifications; ferro-silicon manufacture; coefficient of friction of nickel and copper compression cylinders.

5 Munitions Gages. Munitions gages tested during the month of July at the Washington laboratory include 267 lots, totalling 4720 gages (614 thread gages, 3801 plain gages, 305 profile gages). The average time between the receipt at the Bureau and their shipment away from the Bureau was less than four days. In addition 144 gages were salvaged, about 100 more being in process of that modification. 737 gages were received at the New York Branch and 376 at the Cleveland Branch. Preparations are being made for the opening of the branch at Bridgeport, Conn., and it is expected that that laboratory will be ready for work on August 15.

6 Military Photography. For fog-piercing photography at great distances or from high altitudes in airplanes and anti-camouflage work, very fast panchromatic plates are of great importance. The Bureau of Standards is investigating the properties and application of such plates, including those panchromatized by dyeing, a process which yields extremely fast plates and can be applied to various types of ordinary commercial plates. It has been found that the red-sensitiveness of certain commercial panchromatic plates can be considerably increased by treatment with ammonia. Fairly extensive trials of bathed plates in actual exposures in flight at Langley Field have been made, about 300 bathed plates being so exposed during July. Results have shown clearly the value of red filters and also the possibility of obtaining good photographs by short exposures through such filters.

7 Engineering Instruments. Twelve production samples of high pressure oxygen gages were given special fatigue tests at the request of the Bureau of Aircraft Production. Three makes of high pressure oxygen gages were given special investigation at the request of the Bureau of Aircraft Production to determine the total magnification or displacement ratio of the indicating mechanisms. At the request of the Naval Consulting Board, information was supplied relative to the means available for the measurement of pressure up to 30,000 pounds per square inch. A high pressure gage was calibrated for the Inspection Division of the Ord-

nance Department, and at the request of another office of the Ordnance Department information was given as to the gages commercially available for certain inspection tests being conducted by that office.

8 Roof Ventilators. The Bureau conducted extended tests covering the performance of 33 large roof ventilators of various makes and types of construction which were being considered in connection with the equipment of cantonment and hospital buildings. These investigations were initiated at the request of the Construction Division of the Army. Large differences in the operation of the various types of ventilators were found; the results should be of considerable value in building construction.

9 Airplane Construction. The analysis of various designs for metal airplane construction has been continued and reports on several proposed constructions submitted to the National Advisory Committee for Aeronautics.at their request. The work on the design of variable camber wings is being continued but has been somewhat delayed in obtaining the required grade of steel. Additional strength tests were made of steel beams heat-treated by the Snead process. A tests is in progress on a sample of veneer-covered airplane wing, submitted by the Boston Indurating Company. This wing has glued fastenings throughout instead of nails or screws. The frame work is covered with a thin three-ply veneer instead of fabric, and no drift wires are used. The veneer can be "Indurated", a process which is said to make it weatherproof and non-inflammable. While this particular sample is heavier than ordinary construction it is also proving to be much stronger, so that its weight can be cut down and still afford a large factor of safety.

10 Artificially Dried Woods. Tests of such materials to determine the physical properties of the woods as related to their suitability in replacing air-dried woods in airplane construction, have been continued. Specimens of cypress subjected to the Banks process do not appear to be satisfactory in that the treatment has caused serious hollow horning and interior checking.

11 Steering Wheel Rims. Weathering tests conducted on a number of motor car steering wheel rims for the Motor Transport Service have served to establish the satisfactory weather-resisting qualities of the bakelite coating and other water-proof varnishes and paints used as surface coverings. Rims submitted without

exterior coatings show little or no weather-resisting qualities, and the water-bath test produces entire separation of the sections composing the rim.

12 Impregnated Cardboard Powder Containers. The results of this work, which has been carried out by testing under internal pressure, by submergence in water, and by Mullen and tensile tests of the walls, indicate generally unsatisfactory performance of the fibre containers impregnated with asphaltum, and as a result the Ordnance Department may abandon their use entirely in favor of steel containers.

13 Copper Shell-Rotating Bands. Further tests made on copper rotating bands lead to the conclusion that the cold working of the strip forming the band tends to harden the copper to a condition in which the brittleness is a serious source of weakness. Laboratory tests on strips before and after forming and final shaping show that the cold working increases the hardness while reducing the tensile strength and ductility, this probably accounting for the service failures which have occurred.

14 Brinnell Hardness Table. A table has been compiled of which blue print copies are made, giving the Brinnell Hardness Numerals for every hundredth millimeter indentation diameter from 2 to 7 millimeters and for 500 and 3000 kg per sq. mm pressure. The table will shortly be available for circulation in Technologic Paper No. 11 of the Bureau of Standards, which is being reprinted.

15 Miscellaneous Physical Tests. Cross bend and compression tests were made on fiber tubular masts for supporting wireless antennae; this material showed a lower specific strength than wood. Twenty-one specimens of different aluminum alloys were tested for the War Department. Of these the highest tensile strength (40,000 lbs. per sq. in.) was obtained by "Zelco", which contained: zinc 83%; aluminum 15%; copper 1½%. Bayonet scabbards made of Fabrikoid material both with and without reinforcing were given tests for strength. Tests were made on belts for airplane gunners, according to the specifications of the Bureau of Aircraft Production. The Crowell device for measuring tension in airplane wires was calibrated and found not to be satisfactory for the purpose.

16 Airplane Fabrics. The textile section of the Bureau has again been called upon to develop a cotton fabric

suitable for covering the wings of a type of airplane for which fabrics previously developed have proven unsatisfactory. A material has been developed for the purpose and has proven adequate in service.

Several accidents have occurred because of the failure of the fabric to hold at the places where it was attached to the frame. The Bureau accordingly recommended the use of corded tape at all such points. This has been found to be decidedly effective in improving the security of the wing surfaces.

17 Other Textile Materials. The Bureau cooperated with the military services in developing cloth for parachutes for airplane flares and specifications covering the purchase of this material were drawn up. Samples of French, English and Italian uniform fabrics have been obtained, and are now being investigaged to determine the heat conductivity and serviceability. Several German fabrics which were also analyzed were found to be very good products considering the class of raw material available. The study of the packing of retail clothing materials has been continued and the possibilities of saving largely in packing space without detrimental effect on the articles has been clearly demonstrated.

18 Tests of Miscellaneous Materials. Materials necessarily so classified tested recently totalled 368 samples, including cloths saturated with asphalt, rope lariats with hooks, links, and thimbles, rubber fuse caps, elastic webbing for gas-mask head straps, motorcycle tires, solid truck tires, rubber covered wire, rubber sheet packing, rubber mouthpieces and mouth-piece stock for gas-masks, hot water bottles, rubber air cushions for invalid chairs, fire hose, suction hose, rubber weather-strips fo r revolving doors, rubber flutter valves for gas-masks, celluloid eye-piece material for gas-masks etc., lubricating oils, greases, sole leather, harness leather, leather belting, strap leather, lacing leather, etc.

A celluloid material proposed for gas-mask eyepieces was given special tests in cooperation with the American University Experimental Station of the Chemical Service Section. Tests were made for determining, if possible, the amount of residual solvent, which was thought to be the cause of the blurring of the material. Heating and freezing tests were conducted on rubber flutter valves and packings to determine their action under a wide range

of temperature. Hot water bottles were tested under conditions of heating in dry air and in boiling water, at the request of the Field Medical Supply Depot, the attempt being made to simulate the conditions of use as nearly as possible. Accelerated heat tests were conducted on samples of fire hose and suction hose for the General Engineer Depot. The investigations of pneumatic automobile and motorcycle tires are being continued and work in the development of specifications for bicycle tires and inner tubes has been initiated. Chrome tanned leather fan belts submitted by the Motor Transport Service were tested to determine the stretch at various loads up to the breaking point, applied both to the lap and at the free portions of the belt. Detailed tearing tests were conducted on 4 samples of leather submitted by the Inspection Division of the Ordnance Department.

Tests which have just been completed at Camp Meade on 58 pairs of shoes comprising composition sole on one foot and sole leather on the other, confirm the conclusions reached in other series of tests of these materials, which have been reported in previous issues of this Bulletin. In service tests conducted for the Post Office Department with similar materials one brand of composition soles has proved distinctly inferior to the others and each tested sole of that brand upon which reports have been received has cracked across the ball of the foot in less than six week's service.

Adhesive tapes were given a special adhesion test for the Chemical Warfare Section of the War Department to the end of obtaining information which should underlie specifications for this material. One lot of specially tipped laces and another of specially impregnated laces are being subjected to service tests in comparison with the regulation lace.

11 samples of greases and oils intended for use as automobile transmission lubricants were tested in a worm gear after mixing with varied quantities of water to simulate the conditions which might occur after temporary immersion of the transmission case in service. Determinations of their relative suitability for the intended use were made under these conditions.

At the request of the War Industries Board, specifications were completed for the classification of clay refractories.

19 Investigation of Striae. Continuation of the work on striae testing confirms the previous findings on this subject indicating that light striae in moderate amounts have very little effect upon the excellence of an image formed by an optical instrument. A lens combination of ordinary crown and flint glasses, the crown glass con-

taining a number of fine striae, and the lens having an aperture of about 120 mm and a focal length of about 50 cm was tested with a magnification of about 30. Groups of lines subtending an angle of 5 seconds were clearly resolved. Studies of the influence of striae in the various parts of binoculars have indicated that a fair portion of the finished lenses and prisms at present rejected on account of fine striae could well be utilized without materially impairing the quality of the finished instrument. Photographs illustrating the various types of striae in slabs, prisms, and lenses have been prepared and are available for reference by inspectors and others interested.

20 Optical Glass Production. Some of the flint glasses produced for binocular prisms are showing the extremely good transmission values of 99.5%, and the regular product has a transmission of better than 99%.

Experimental work in the production of glass suitable for the lenses of airplane cameras is progressing favorably. It is hoped that the Bureau of Standards will soon be providing for the use of the Bureau of Aircraft Production a suitable quantity of dense barium crown glass.

The Pittsburgh Branch Laboratory made 4 melts of dense barium crown, 2 of boro-silicate, 1 of light flint, 3 of barium flint, 6 of medium flint, and 2 of light barium crown, totalling 18 melts. 1300 pounds of glass blocks and 35 pounds of lens blanks were shipped from this plant during July.

21 Other Optical Testing. During one month recently there were tested a total of 674 binoculars of various makes and types, in addition to several special and more detailed investigations, and the refractive indices and dispersion of 80 samples of glass and the transmission of 44 samples were determined. Other work recently completed includes the optical examination of 78 field glasses, 15 photographic lenses, and 36 samples of goggle glasses. The radii of curvature of sixteen pairs of lens test plates were measured for a manufacturer of optical instruments. Work on goggles and glass for goggles is being continued with a view to obtaining sufficient information for setting up specifications for goggles for the various classes of work involving eye hazards.

Investigation was made of a case of unusually low transmission of glass used in the prisms of a certain binocular and as a result the employment of the defective material was discontinued.